INSTITUTE OF PETROLEUM REVIEW

Published by The Institute of Petroleum
26 Portland Place, London, W.1
Telephone: LANgham 2250 Telegrams: Instpetech, Westdo, London
Volume 2. No. 23. November 1948. Price 2/-. Annual Subscription: One Guinea

PUBLIC LIBRARY
JAN 8 - 1949
DETROIT

IN
ALL NEW
PROJECTS

INCLUDE

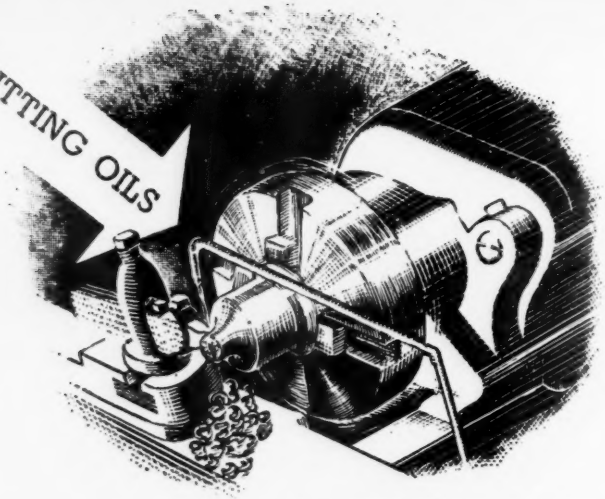
Foamite

FIRE-FIGHTING
EQUIPMENT

Write for latest literature:—

FOAMITE LTD.
LANGLEY, BUCKS.
ENGLAND

FOR CUTTING OILS



& CUTTING COSTS

SULPHURISED OILS

ARE INVALUABLE E.P. COMPONENTS

★HIGH TOTAL SULPHUR WITH
LOW FREE-SULPHUR CONTENT

★NON-CORROSIVE, NON-STAINING
WITH YELLOW METALS

More than an Additive
More than a Base . . .

ANCHOR CHEMICAL COMPANY LTD.
MANCHESTER 11

London Office: Grand Buildings, Trafalgar Square, W.C.2

Scottish Agents: J. & G. Hardie & Co. Ltd., 178 Fulton St., Glasgow, W.3

INSTITUTE OF PETROLEUM REVIEW

Hon. Editor: F. H. Garner, O.B.E., Ph.D., F.R.I.C.
Hon. Associate Editor: E. B. Evans, Ph.D., M.Sc., F.R.I.C.
Editor: George Sell

No. 23 NOVEMBER, 1948 Vol. 2

CONTENTS

THE BIRMINGHAM CONFERENCE BY C. M. CAWLEY 321
U.K. PETROLEUM CONSUMPTION 329
LUNCHEON TO DR TUEMMLER 330
MNEMONICS FOR GRAVITIES 331
COLLOIDAL GRAPHITE BY E. A. SMITH 332
A VISIT TO THE MIDDLE EAST BY C. T. BARBER 337
PRIME MINISTER OF NORTHERN IRELAND VISITS LOBITOS REFINERY 344
MIDDLE EAST OIL SUPPLY TO WESTERN EUROPE 345
STEEL BY THE MILE 347
PERSONAL NOTES 349

THE BIRMINGHAM CONFERENCE

By C. M. CAWLEY*

PART I.—AN IMPRESSION OF THE CONFERENCE

INTRODUCTION

WHEN the organizing committees of the Institute of Petroleum and the Institute of Fuel were arranging the Joint Conference on "Modern Applications of Liquid Fuels" they had good reasons for hoping that its technical and personal value would ensure its success. In the event, which took place at Birmingham University on September 21 to 23, their hopes must have been so far exceeded as to give them the greatest pleasure and gratification and perhaps even a mild surprise. It is true that a capricious weather clerk at times gave the proceedings more than a hint of autumn as a reminder of his importance in heat problems, but the chill this might have produced was dispelled (or at any rate confined to the lower extremities) by a warmth which, knowing nothing of thermodynamics, springs from good fellowship and an interested mind.

The idea of holding a joint conference was born last year when the lamentable results of the fuel "crisis" emphasized the national need for greater efficiency in the use of fuel. The idea was enthusiastically received by the two Institutes, and indeed, enthusiasm has marked the course of the Conference from conception to realization. A large contribution to its success, as Sir Ernest Smith acknowledged at the opening ceremony, was the thought,

*Fuel Research Station, Department of Scientific and Industrial Research.

inspiration, and driving power of John A. Oriel, the President of the Conference. A contribution no less important was made by the pleasing and distinguished academic setting which endowed the Conference with an individual character so often lacking on such occasions, and all members of the Conference—there were over 500 of them—will wish to pay a tribute to the University authorities and to Professor F. H. Garner and his colleagues for their generous hospitality.

Scope and Achievement

The scope of the Conference was the whole field of liquid fuel application with the exception of the lightest fractions. The wide range of the contributions made by British, American, and French authors is indicated in the second part of this article which contains a brief summary of all the papers presented. Much is necessarily omitted from this summary and readers interested in the subject are advised to consult the Conference records, which will appear in due course; they will find them a storehouse of valuable information.

The achievements of the Conference were many. Uppermost in the minds of Conference members will be the memory of the opportunities they had to discuss their problems, and their views on matters large and small, with old and new friends in many industries. The keynote of the Conference, as the President said in his address, was the recognition by coal and oil technologists of their joint responsibility for ensuring the utmost efficiency in the utilization of our fuel resources. As the magnitude of the technical problems of industry is more clearly appreciated, it daily becomes more evident that their solution requires the attention of experts from many fields of science, and that the division of scientists into separate packets of organic chemists, mechanical engineers, and the like, is totally unrealistic and inadequate to modern needs. It is, therefore, to be hoped that the Birmingham Conference was but a token of an enduring intention of the two Institutes to work still more closely together in future, and that it will, moreover, mark a new phase of collaboration with other institutes and societies which share a common interest.

For those to whom the inception of a period of co-operation may seem too uncertain or even nebulous to be styled an achievement, there was a more tangible accomplishment—perhaps the most important of the Conference—about the value of which everyone will agree. This was the provision of a store of technical knowledge about the use of oil which will form a serviceable work of reference for many years to come. Here you will find, for example, detailed information about the use of oil in the gas industry, the principles of combustion chamber design for the gas turbine, and the design, operation, and performance of burners and furnaces, agricultural driers, and diesel rail traction engines. The treatment of every subject is rich with the results of practical experience. If, when pondering a problem in oil utilization you consult the records of the Birmingham Conference, you may or may not find the solution there, but you can hardly fail to find something that will help.

Finally, for many members of both Institutes the Conference will perform its greatest service in furnishing the data necessary to make a sound assessment of the place of oil in the nation's economy, and in providing a wide survey of the present position of the use of oil in relation to the use of coal.

Oil v. Coal

It is possible that the President of the Conference would not approve of this title on the ground that it implies a competition between oil and coal,

whereas he would prefer to regard the fuels as complementary, each having a special use to which it is more fittingly applied. No one would seek to deny the broad truth of this view, but in some relatively limited fields where coal and oil can be used alternatively, with the balance of advantage moving from one fuel to the other for a small change in the differential price of coal and oil, or a small improvement in the efficiency with which one of the fuels is used—in such fields, it could be argued, coal and oil may properly be regarded as competitive.

These fields are naturally of great interest to fuel technologists, but it is important that they should be kept in perspective in relation to the whole realm of present fuel application. Their magnitude must not be exaggerated, and it must be remembered that the bulk of each fuel is used for purposes for which it may be supplemented, but not supplanted, by the other. Applications for which coal and oil can be used interchangeably, however, are none the less of vital national significance, including as they do, for example, the steel making and metal fabricating industries.

Oil has several advantages over coal. It is more easily handled and stored, and is cleaner in use. The great value of these qualities, though it cannot always be readily assessed in economic terms, is firmly established, and has been responsible, for example, for the replacement of coal by oil for use at sea.

A still more important advantage of oil for many industrial purposes is that methods of scientific control can be more readily applied to it than to coal, and for this and other reasons oil is frequently used with greater efficiency. The use of oil, moreover, diminishes standby losses.

For applications in which oil achieves the benefits of these advantages, therefore, oil is always the preferred fuel, provided only, as A. J. Fisher said, that you can get it and that you can afford it. For in most countries, and especially in Great Britain, coal has the overriding advantage of lower cost. Nor do its advantages always end there. Much was heard at the Conference about the deterioration of product quality occasioned by the use of high-sulphur fuels in the steel and the metal industries, and wherever a low sulphur content is desirable, producer gas and coal-tar fuels may have an appreciable advantage over petroleum fuel oils.

The scene in the Great Hall of Birmingham University during one of the sessions.

In general, however, the balance of the technical advantages lies with oil, and the choice of fuel largely depends on the value of the price differential of coal and oil. This is not the same in all countries and it follows that a completely successful conversion from coal to oil firing for a particular operation in either America or France—in both of which countries the price differential may be more favourable to oil than it is in Great Britain—does not necessarily mean that oil firing would be beneficial for the same operation in Britain.

If both fuels are freely available, then the natural interplay of technical and economic forces will ensure that the more suitable fuel is chosen for each purpose. Thus in America the steel industry, which had previously been largely based on coal, turned to petroleum for a large part of its fuel supplies at a time when fuel oil was relatively very cheap. The attractive results obtained were not without their effect in the United Kingdom, but the chief driving force responsible for bringing about the conversion to oil firing of many installations, was not one of economics or technology, but of supply, arising from the serious coal shortage with which we have been afflicted in the post-war years.

It is, perhaps, not too much to say that some manufacturers plunged into coal-to-oil conversions with an enthusiasm and an optimism which were not always justified by the results. The results have in fact been variable, and there is still considerable divergence of opinion as to the relative merits of coal and oil. The comparative data obtained for producer-gas and oil fired furnaces have sometimes been unfair to both fuels; to producer gas because the oil was frequently applied with greatly improved instrumentation and scientific control, and to oil because of the unsuitable furnace design.

In the steel industry, however, it is evident that the scientific application of oil firing is capable of giving greater thermal efficiency and increased production than is conventional practice with producer gas. It is equally evident that the precise conditions and price differential for coal and oil which justify the conversion from one fuel to the other have still to be accurately assessed. Whilst what one speaker at the Conference described as the first fine flush of enthusiasm for oil firing is dying down in Britain, the supply position and the price differential in America have started a reverse trend from oil to coal firing. This fact should sound a warning to British technologists to temper enthusiasm for the evident advantages of oil firing, with a sound assessment of all the technical and economic factors.

Further improvements are certainly to be expected in oil firing, and it is hoped that they will be accompanied by parallel developments in coal firing. In this connexion, it is perhaps pertinent to ask whether oil firing would have been either technically or economically attractive in Britain, if producer-gas firing had been applied with the same instrumentation and scientific control that it is customary to employ for oil firing.

However that may be, it will be noted that combined oil and coke-oven gas firing is being applied successfully to some open-hearth furnaces in America without loss of production. This may be an indication of a future development by which the advantages of both fuels can be obtained. Is it, moreover, not possible that, with the proper integration of coke ovens, blast furnaces, and steel furnaces, and with the judicious use of the gas and tar, the results may be technically equal and economically superior to the best that oil firing can achieve?

In conclusion it may be said that coal and oil have separate kingdoms where each in the main reigns supreme, and it cannot be urged too strongly that, in the region where they overlap, the only aim of fuel technologists is the selection and efficient utilization of the fuel which can most suitably be empioyed for each particular purpose. Competition in some fields there may be, but it will be competition to achieve that higher efficiency which will just tip the balance in favour of either oil or coal. There is, and will for long remain, so great a demand for energy and power in our country in relation to the available

supplies of fuel, that there can be no question of one fuel supplanting the other.

There is much that coal and oil technologists could learn from each other, and it is in the national interest that they should do so. Let us not in our modern cynicism then, be afraid to confess our belief that the collaboration of scientists, in applying their skill to industrial tasks, may so enhance industrial efficiency as to play a large part in restoring the prestige and the well-being of the nation.

PART II

SUMMARY OF PAPERS PRESENTED

PRESIDENTIAL ADDRESS

The Place of Liquid Fuel in the British Economy, by J. A. Oriel.

The keynote of the address is the joint responsibility of the Institutes of Fuel and Petroleum to ensure that all kinds of fuel available in Britain are used with maximum efficiency. Coal and oil are not competitive: each has its proper place in the national fuel economy, and the chief object of the Conference is to assess the relative advantages of the two fuels for various purposes.

The conversion from coal-burning to oil-burning equipment has been accelerated by the coal shortage, but there is also a world shortage of oil. This is largely due to increased demand, but development has been hampered by the ravages of war and the shortage of steel and other materials. For the moment, therefore, quantity rather than quality of oil must be the first consideration, and where possible use must be made of residual rather than distillate fuels.

The relative advantages of coal and oil are examined, and it is seen that for a number of industrial and domestic purposes, oil gives the advantages of greater thermal efficiency in use and of reduced standby losses. The ease of handling and storage, and the greater cleanliness of oil are advantages of special importance to shipping. On the other hand, coal will remain the chief source of fuel gas and the principal fuel for the blast furnace.

FUEL OIL IN THE STEEL INDUSTRY

Oil-Fired Open-Hearth Furnaces : A Review of British Practice, by T. C. Bailey.

The first furnace was converted from producer-gas firing to fuel-oil firing in 1945, and now 100 oil-fired furnaces are in use. In this paper a description is given of the handling of the oil, burner and furnace design, fuel efficiency, instrumentation, and operation. Necessary improvements and possible developments are indicated. For example, it is considered that further attention should be given to burner design, and it is suggested that two atomizers, one for each of the two distinct flame conditions required, might with advantage be combined in one water-cooled burner gun. The importance of using the minimum quantity of excess air is stressed. The main advantage of oil firing is that it gives an increase in output of 15 to 25 per cent. It is considered that the heat input per ton of steel should always be less with oil than with producer gas, but oil consumption at present varies from 22 to over 40 gallons per ton.

Some of the conference members found time in the luncheon interval to stroll around the University.

The Open-Hearth Furnace: A Comparison of Oil and Producer-Gas Firing, by I. M. D. Halliday.

Two 80-ton Venturi-type furnaces, originally fired by producer gas but subsequently converted to firing by heavy fuel oil, provided comparative data for the two fuels. It was found that the rate of production and the roof life were practically unaffected by the choice of fuel, but oil firing increased the campaign life from 33 to 46 weeks while using six roofs in place of four. The amount of coal replaced by one ton of oil was 1·76 tons; the average heat input was 13 per cent less with oil than with gas, but inputs were practically identical at the maximum rate of steel making. The more severe jet action due to the greater velocity of the oil flame caused greater air inleakage and lower waste-gas temperatures, and led to longer checker life being obtained with oil firing at the expense of fuel efficiency.

Fuel Oil in the Steel Industry in the U.S.A., by A. J. Fisher.

Open-hearth furnaces in past years were converted to oil firing to take advantage of the increase in thermal efficiency and steel production obtained with oil as fuel. The choice of fuel for other operations has depended on the proximity of coal mines and oilfields and on transportation costs. A review of the present fuel situation in U.S.A. shows that the heavy demand for oil and the present supply position have produced a trend from oil to coal in the heavy industries. This has started in the steel industry where coke-oven gas is being used in some open-hearth furnaces to replace about half the fuel oil without loss in production. A large part of the paper is devoted to a well-illustrated account of the various applications of fuel oil in the steel industry.

DOMESTIC FUELS

The Use of Liquid Fuels for Domestic Heating, by J. S. Jackson.

The author is a member of a committee of the Institute of Petroleum, set up at the request of the Ministry of Fuel and Power, to study the use of liquid fuels for domestic heating. In the lecture he gave an outline of the findings of this committee, which is soon to publish a full report.

The aim of all technologists concerned with domestic heating is to achieve a higher standard of comfort and convenience in the home by the more efficient use of fuel. On the basis of heat content, oil is more costly than solid fuels, but it has the advantages of ease of handling, convenience in storage, ease of control, and low standby losses. An account was given of the characteristics, and methods and conditions of use of bottled gas and kerosine, both for space and water heating. Typical modern appliances were described and attention was drawn to their high thermal efficiencies. With regard to the flueless heater, the objections which are sometimes made that it causes contamination of the atmosphere with carbon monoxide, sulphur dioxide, and odoriferous vapours were shown to be groundless.

FUEL OIL IN THE METAL INDUSTRIES

The Use of Fuel Oil in Furnaces for the Iron and Steel Fabricating Industries, by M. Roddan.

The use of fuel oil in the British iron and steel industries has increased steadily during the last thirty years, particular advantages being ease of control and increased output. The greatest importance attaches to fuel efficiency, and the factors influencing combustion are described, prominence being given to the effects of excess air, air preheat, and flame temperature. An atomizing burner is used, and in the vast majority of installations air is used for atomization. Attention is given to the construction and operation of the normal types of burner, and their different fields of application are noted. A large part of this generously illustrated paper is devoted to the description of the design, operation, and performance of a number of typical oil-fired furnaces.

Fuel Factors in Non-Ferrous Fabrication, by Leslie Aitchison.

The principal operations in the non-ferrous industries in the U.K. are the purification, alloying, casting, and working of metals. Very high temperatures are not required for any of these operations and fuel consumptions are consequently not high. It follows that the thermal efficiency of fuel utilization is less important than some other factors such as furnace atmosphere, which may cause a deterioration of the metal, or a

loss of metal, for example as oxide or sulphide; a loss of as little as 1 per cent will in many cases introduce an additional cost greater than the total cost of the fuel. An account is given of the technical and economic considerations which influence the choice of a fuel.

FUEL OIL IN THE GLASS AND CERAMIC INDUSTRIES

Conversion of Glass Furnaces to Liquid Fuels, by R. Pigrais.

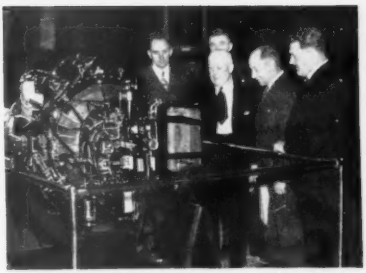
An account is given of French experience in the conversion to oil firing which has been occasioned by the present shortage of solid fuels. The advantages and disadvantages of the burners available on the French market are enumerated. Excellent results have been obtained with a water-jacketed, mechanically atomizing burner, and its design, arrangement, and use are described. The advantages of liquid fuels are elimination of a gas producer, reduction of labour, increased production, and improved heat economy; the disadvantages are high cost of initial installation and certain technical difficulties including those due to the deleterious effects of sulphur.

The Use of Fuel Oil in Glass Furnaces, by W. R. Bulcraig.

The principles of the glass tank furnaces are outlined and an account is given of the application of oil firing which was made in response to the Government's appeal in 1946. Heavy fuel oil was used and pressure jet atomization proved to be entirely satisfactory. The results of trials with oil firing and producer-gas firing are detailed, and a comparison is made of thermal, economic, and other factors. Oil firing gives the advantages of greater ease of control and increased rate of glass melting, and the disadvantages of increased wear on refractories, greater fuel cost, and greater overall cost per ton of glass. At present prices, therefore, the use of fuel oil is not economic compared with an efficient producer-gas system.

The Use of Fuel Oil in the Pottery Industry, by A. Dinsdale.

The limited experience of oil firing in the pottery industry does not permit a final judgement of this method of firing to be made. "Bottle" and tunnel ovens are described and illustrated; the former are intermittent, coal-fired ovens, and the latter are continuous ovens fired by town gas or producer gas. The ways in which different kinds of pottery affect the technique of firing are explained. The relative merits of coal and oil firing are considered and it is concluded that for tunnel ovens, oil firing gives the advantages of increased output and greater fuel economy, but suffers the disadvantages of higher capital and fuel costs. The possible advantages of oil firing are smaller for tunnel ovens.



By courtesy of the Birmingham Gazette

The Rolls-Royce Derwent engine was a centre of interest. Here we see (left to right) *A. J. Fisher, Iain M. D. Halliday* (in rear), *N. L. Hudson, John A. Oriel* (President of the Conference), *and T. C. Bailey studying this exhibit.*

GAS TURBINES FOR LAND AND MARINE POWER PURPOSES

The Gas Turbine and its Combustion Problems, by I. Lubbock and I. G. Bowen.

A comprehensive account of the subject opens with an outline of the four main cycles of the gas turbine, and the dependence of thermal efficiency on turbine inlet temperature and heat exchange is explained. The principles of combustion chamber design are described and an account is given of a multi-tip burner suitable for a wide range of fuel requirements. The effect of ash deposition and other factors influencing the use of heavy residual fuel are indicated. The importance of heat-exchanger design is stressed and the characteristics of various types of recuperator and regenerator are discussed in relation to size, flow resistance, and deposit formation. Consideration is given to the application of the gas turbine to locomotives, marine power plant, power production, and various industrial processes. Relative efficiency and cost data are given for the competing forms of power plant for the use of diesel oil, fuel oils, and coal. The necessity for the continued development of the gas turbine to use heavy fuel oils is made evident.

AGRICULTURAL DRYING PROCESSES

Fuel Economy in Grass Drying with Particular Reference to the Use of Liquid Fuels, by K. H. Sambrook.

Grass drying reduces imports of animal feeding stuffs, but consumes fuel which would otherwise be available to increase exports. Cost data, however, show a large balance in favour of grass drying. The principles of the different methods of grass drying are explained and it is shown that there is little difference in thermal efficiency between low-temperature driers employing recirculation and high-temperature pneumatic (parallel flow) driers. Other factors such as capital cost, speed of drying, and form of product desired, thus decide the choice of a drier. Oil fuel has several advantages for use in the direct mixing air heater, which provides a mixture of air and combustion gases—the usual drying medium. Several oil-fired designs are described, and the requirements of efficient operation and maximum fuel economy are given.

Oil Firing for Grain Drying, Hop Drying, and Malting, by W. A. Hubbard.

Oil is regarded as the ideal fuel for low-temperature crop drying, and many conversions from solid fuel firing have been made. A description, illustrated by drawings, is given of the design, operation, and performance of the various types of installation, including agricultural driers used with combine harvesters, communal grain driers, oast houses, and malt kilns. Malting is the most difficult drying operation dealt with, and the control of this process receives special attention. Most grain driers and malt kilns are direct-fired, but direct and indirect firing are both used in the hop industry. The majority of plants are suitable only for burning light distillate oils, and low-pressure or medium-pressure burners are almost invariably used. A high standard of fuel economy has been reached in many types of drier.

DIESEL ENGINES FOR POWER GENERATION AND RAILWAY TRACTION

Diesel Engines and Their Fuels, by P. N. Everett.

The characteristics are given of suitable fuels for high-speed, medium-speed, and slow-speed diesel engines. High-speed engines should be supplied with a fuel of automotive gas-oil quality, but medium- and slow-speed engines do not require a fuel of such high grade. The conditions necessary to ensure the satisfactory burning of fuel oil in these engines are described. It is considered that full use is not being made to-day of the ability of medium- and slow-speed engines to burn low-grade fuels, and an important advantage of the big diesel engine is consequently being lost.

Diesel Rail Traction, by F. H. Horner.

The requirements of rail traction are described and attention is drawn to the advantages of the diesel-electric locomotive over the steam locomotive and the electrified-line system. The disadvantage of the diesel locomotive is the greater capital cost, but it is shown that for shunting work the running costs of the diesel-electric are much lower than those of the steam locomotive. The development of the diesel locomotive in Europe, Britain, and America is traced, and a detailed account is given of the design, control, and performance of modern diesel rail traction engines. A point of interest is that the early engine allowed the use of lower grade fuel than the modern engine, which with its high-pressure airless injection and its high speeds requires the use of gas oil.

The Recovery of Waste Heat in Diesel Engine Operation, by T. R. Houston.

The thermal efficiency of diesel-electric generation is about 35 per cent. With waste

The two institutes who orgcnized the Conference took the opportunity of bringing their publications to the notice of fuel technologists and users.

heat recovery, the overall efficiency can be raised to 70–80 per cent, when providing a supply of hot water at about 180° F, or to 56 per cent when providing a supply of steam at 30 p.s.i. (gauge). Consideration is given to methods of meeting the difficulty introduced by the independent variation of engine load and demand for heat.

OIL FOR GAS-MAKING

The Use of Hydrocarbon Oil in the Manufacture of Town Gas, by H. S. Cheetham.

The chief raw material for the production of town gas in Britain is coal. The gasification of hydrocarbon oil is, however, valuable in that it confers flexibility on the gas-making process, facilitating the provision of peak-load gas and the gasification of coke, while maintaining the required calorific value of the gas. The most widely established plant for oil gasification is the carburetted water-gas plant, and the oil used almost exclusively in the U.K. is gas oil. The plant is described, and the reasons for the preference for gas oil are given. An account is also given of other gas-making processes in which oil is the only raw material, and typical results are compared.

Carburetting Blue Water-Gas with Heavy Fuel Oil, by P. T. Dashiell.

The use of heavy fuel oil for carburetting blue water-gas, now adopted generally throughout the United States, depends for its success on the control of coke deposition to give long periods of uninterrupted operation and to achieve gasification of some of the coke. This has been done by using the heat in the top of the generator and the walls of the carburettor. About half of the oil is admitted at the top of the generator and half at the top of the carburettor. The carburettor is without checker-brick and the oil is charged through a nozzle producing a fine spray in the shape of a cone or some other pattern which prevents the oil coming into direct contact with the walls of the carburettor. The coke deposited is periodically removed by hand from the floor of the carburettor.

The Use of Petroleum Oils in the French Gas Industry, by Robert Delsol.

The shortage and high price of coal in France are encouraging the use of petroleum oils, especially fuel oils, for which a vast programme of production, importation, and consumption is planned. Carburetted water-gas practice in France is described and the reasons are given for the greater development in America of carburetting with fuel oil. Costly modifications to carburetting plant are required to achieve satisfactory results with fuel oil and are justified only if a supply of suitable oil is assured. The characteristics of fuel oils available for gas-making are reviewed and assessed. An account is given of the operation of the Geim generator and of various processes of cracking petroleum oils in carbonizing systems, which have been used as temporary measures at smaller gasworks.

U.K. PETROLEUM CONSUMPTION

FIGURES for the quantities of petroleum products entered for home consumption in the United Kingdom during the first half of 1948 in comparison with the same period of 1947 show an increase in the aggregate of 38·3 per cent. Compared with the first half of 1938 the increase is 88·3 per cent. Figures from the official return* are:

	January to June		
	1948	1947	1938
	Million gallons		
LIGHT OILS			
Motor spirit ..	591·7	663·1	649·6
Other spirit ..	23·5	22·1	16·7
HEAVY OILS			
Road fuel oil ..	92·5	78·3	40·3
Other fuel oil ..	783·9	203·7	154·8
Kerosine	243·5	210·1	103·1
Lubricating oil ..	80·9	70·4	63·8
Gas oil	182·6	198·5	34·0
Other heavy oils ..	5·7	4·2	3·2
Total	2004·3	1450·4	1065·5

Comparing 1948 and 1947 the most noteworthy points are the reduction in the consumption of motor spirit by 10·8 per cent and in consumption of gas oil by 8·0 per cent. The principal increase in the period was for "other fuel oil" with a rise of 284·8 per cent over 1947 and 406·4 per cent over 1938. Kerosine consumption was 16 per cent higher than in 1947 and 136·2 per cent higher than in 1938. Road fuel oil likewise went up by 18·1 and 129·5 per cent respectively.

* "Accounts Relating to Trade and Navigation of the United Kingdom, July 1948." H.M.S.O., London

LUNCHEON TO DR TUEMMLER

On September 28, 1948, members of the I.P. Standardization Committee gathered at luncheon to welcome Dr F. D. Tuemmler, a member of A.S.T.M. Committee D-2 on Petroleum Products and Lubricants.

Mr E. A. Evans (*President of the Institute and Chairman of the Standardization Committee*) said:

"We are here to-day to pay our very profound respects to Dr Tuemmler, who is the third representative of the A.S.T.M. to visit us this year. We have good reasons for being very satisfied with the co-operation we are receiving from that powerful body, and we trust that the unity which exists between us will continue for a long time. By our unity we can achieve much for the benefit of the world. Already the petroleum industry, and the many thousands of petroleum users, in the United States of America and Great Britain have saved thousands of dollars and pounds. Now we are anxious to encourage other nations to share the advantages of the work of D-2 and the I.P. Standardization Committee. There is evidence that several European countries have been won over to our way of thinking, and others are flirting with us. Perhaps Dr Tuemmler can tell us what progress is being made in South America.

"It is useless for us to sit in our respective headquarters hoping that our good work will become known in other countries. Through our contacts we must spread the news. We must not abdicate our teaching functions. It is essential that wrong methods of test should be eliminated. People often forget the evil wrought by the prolonged duration of error, to which an added particle of truth may give new vitality. They overlook the ultimate enervation that is so often the price paid for the temporary exultation.

"Much of the parochial outlook in the past has been due to misguided national pride. Lately, many parts of the world have been reminded rather forcibly that other people's research and operation counts for something. So it would appear that now is the time to get people away from the temporary usefulness of error.

"The arrangement by which we accept members of D-2 on our Standardization Committee, and D-2 accept members of our committee as honorary members is a particularly happy one from many points of view. One of which is that an honorary member is received not as a visitor but as a guest. He can be outspoken, or even rude, without causing offence. If the strength of our English beer is too great for him he blames nobody; he simply takes heed for the future. We do expect him to come to our meetings whenever he can, and take part in our discussions. We have called a special meeting this afternoon so that we can have the benefit of Dr Tuemmler's guidance.

"Dr Tuemmler is an honorary member of our Standardization Committee. He has visited us before, and we all hope that he will come again."

"Mr F. L. Garton (*Deputy Chairman of the Standardization Committee*) said: . "I am glad to have the opportunity of adding my word of welcome to Dr Tuemmler. Dr Tuemmler is with the Shell Development Company in its laboratories at Emeryville and is concerned with the standardization of testing methods. He is also secretary of the Shell Standardization Committee. The Shell Group has found need for tests not standardized by the A.S.T.M. or by the I.P. and these are included in their own methods book, which also contains many A.S.T.M. and I.P. methods with or without modifications.

"There is close co-operation between the Shell Standardization Committee in

the U.S.A. and the Shell Central Standardization Committee in the U.K.

"I hope that in future there will be more opportunity for A.S.T.M. members to visit Great Britain. It is important that A.S.T.M. and I.P. methods should be adopted in as many countries as possible. In this direction personal contact can do much and I ask all members of the Standardization Committee to let us know when any A.S.T.M. members are in Britain."

Dr Tuemmler: "I greatly appreciate the fact that this meeting has been arranged. I am certain that the only way in which any appreciable agreement in standardization is likely to be reached is by a knowledge of the background of the particular method. Such knowledge can only be obtained by being present at the meetings in order to understand the prejudices which may exist.

"The A.S.T.M. must, I feel, give much consideration to the suitability of its methods for more than mere parochial needs.

I would take this opportunity of saying that we on Committee D-2 will welcome any of your committee members who may find it possible to attend any of our meetings."

MNEMONICS FOR GRAVITIES

A.P.I. Gravities

Remembering that specific gravities fall as A.P.I. figures rise, specific gravities from 1·0 to 0·6 are written down in a column in descending order. Against the first of these, 10 is set in the second (A.P.I.) column, with 15, 20, 25, and 30 in the third column. All these figures are shown in heavy-face type. The A.P.I column is completed by saying 10+15, 25; 25+20, 45; 45+25, 70; and 70+30, 100.

The fourth column gives the amounts which should be added to the tabulated A.P.I. figures to give better accuracies; it is not suggested that these should be used except as showing that the simple mnemonic table is not in error by as much as 1° A.P.I. except at specific gravities below 0·66, this including interpolation to any intermediate gravity.

Sp. Gr.	A.P.I.		
1·0	**10**		+0·0
		15	
0·9	**25**		+0·7
		20	
0·8	**45**		+0·4
		25	
0·7	**70**		+0·6
		30	
0·6	**100**		+4·3

Densities

For the same oil at the same temperature, diminution of the specific gravity figure by 1/1000th of itself gives the corresponding density figure; and conversely, increase in the density figure by 1/1000th of itself gives the equivalent specific gravity figure. As examples, a specific gravity figure of 0·7654 corresponds to a density figure of 0·7654 less 0·00077, or 0·7646; while a density of 0·9876 corresponds to a specific gravity of 0·9876 plus 0·00099, or 0·9886. With proper rounding-off, the conversions are correct to the fourth decimal place.

Underlying the rule is the fact that oil weights are compared with that of water at 4° C when densities are concerned, while ordinary specific gravities compare these with water at 60° F. The density of water at 4° C is, of course, 1·0000, while at 60° F it is 0·9990. Since the divisor is slightly greater for densities than for specific gravities, specific gravity figures are slightly larger than those for corresponding densities.

P. Kerr

United Kingdom sales of **furfural** produced in the U.S.A. by the Quaker Oats Co. of Chicago are now being handled by Imperial Chemical Industries Ltd. as sole selling agents.

COLLOIDAL GRAPHITE

By E. A. SMITH

". . . By reason of the particle tenuity of fineness it penetrates the porous surface of metals, and coming into such close contact with their intermolecular structure, approaches a condition of graphite combination." In that shrewd observation on the action of colloidal graphite on bearing faces, made in 1913, Mabery[1] was indicating that the microscopic particles of graphite became adsorbed to metal. The development of electron optical instruments, in the interval, has confirmed this adsorption, and also defined more clearly the mode of action of colloidal graphite in lubrication. An interesting picture has been unfolded, such as that of better orientation of polar molecules on the graphoid surface, its relation to the Beilby layer, and other features which serve to underline that the action of colloidal graphite and lubricating oil are mutual.

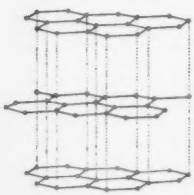


Fig. 1

The structure of graphite is shown in Fig. 1, which does not, however, include the rhombohedral modification indicated by Lipson and Stokes[2] which may possibly occur to the extent of a few per cent of the whole. The occurrence of its component atoms in sheets produces slip planes in graphite, upon which rests, directly or indirectly, its lubricating character. Savage[3] has recently stated that it is the "enormous" adsorptive capacity of graphite which accounts for some of its lubricating power.

For lubrication, graphite must not only be pure, but very finely divided so that it may accompany its liquid carrier, generally oil, wherever the latter goes, however fine the orifices or channels. This is achieved by colloidalizing and stabilizing the product. In practice the results may vary, but as a matter of interest the colloidal graphite produced by the Acheson process, which is customarily employed in Britain, exhibits a particle range of about 2 microns down to sub-microns. A comparison of the particles with the corpuscles of frog's blood is given in Fig. 2. In Fig. 3 is shown how this fine particle size enables a dispersion of colloidal graphite in a hydrocarbon to pass through more than thirty Whatman filter papers in succession, while its ability to climb through

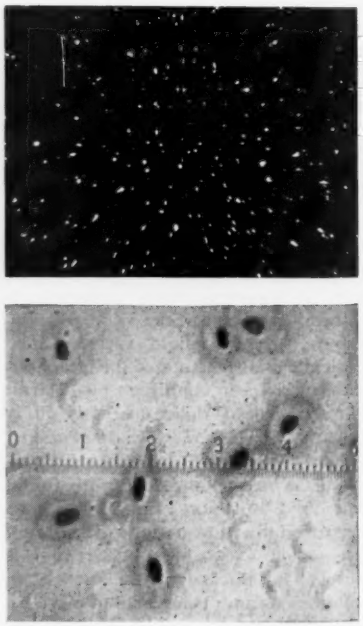


Fig. 2
(Top) *Photomicrograph* (x562) (*dark field*) *of colloidal graphite.*
(Bottom) *Photomicrograph* (x900) *of corpuscles of frog's blood.*

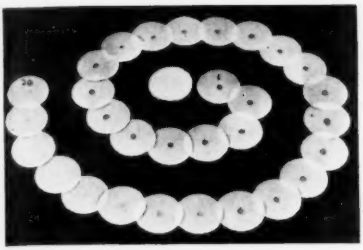


Fig. 3

wicks, with the oil carrier, is illustrated in Fig. 4.

If one examined, in the microscope, "Aquadag" colloidal graphite in water, which is, incidentally, an international standard for calibration of electron microscopes, the particles will be seen to exhibit active Brownian movement, and scintillation, in the dark field. The former indicates a truly colloidal state, while scintillation informs one that the particles tend towards a plate-like shape.*

The Graphoid Surface

When a bearing is lubricated with oil containing colloidal graphite some of the particles are rubbed into intimate contact with the metal, become adsorbed, and constitute what is now known as a graphoid surface. The existence and structure of this graphoid surface has been confirmed by electron diffraction and other methods. It is composed of extremely small, plate-like particles of graphite lying like tiles on the metal surface, and held firmly to the latter by adsorption. Fig. 5 shows an electron diffraction pattern of this surface, which is invisible by direct optical means. Its thickness is a matter of millimicrons and, being held in place by adsorption, it cannot be washed off mechanically by oils or petrol.

Some Properties of the Graphoid Surface

A considerable amount of work has been done on the graphoid surface, upon which it is only possible to touch. The static friction[4] is in the vicinity of 0·12 and the kinetic friction, at high loads, and low rubbing speeds, in the vicinity of 0·06.[5] By way of comparison it might be added that the static value for a mineral oil film would be about 0·15, and kinetic friction under similar loads and speeds, which give boundary conditions, 0·10 or higher. It is evident that such a surface can provide valuable assistance in such conditions, but where fluid film conditions exist the surface would not contribute to a reduction in friction, for obvious reasons.

If its main function would appear to be reducing static friction and offsetting the effects of boundary conditions, the relation of the graphoid surface to the oil film is no less interesting. The X-ray diffraction patterns of Fig. 6 show (*a*) the relative lack of orientation of stearic acid on polished mild steel and (*b*) the rapid orientation of this fatty acid on the steel on which a graphoid surface has been formed.

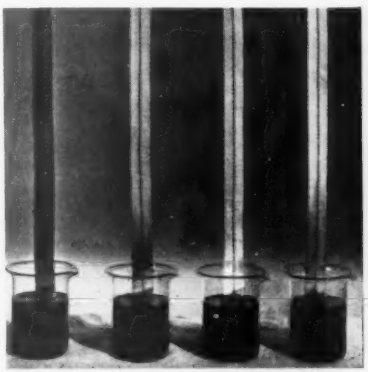


Fig. 4

*Recent work at the Clarendon Laboratory, (*Nature*, May 8, 1948), on this aqueous dispersion, shows that the mean particle size lies around one micron, calculated from Einstein's theory of Brownian movement. Electron microscopy, elsewhere, confirms the plate-like tendency in shape of the particles.

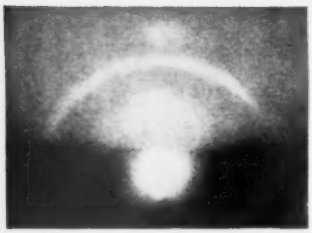


Fig. 5

This adsorptive capacity leads to improved oilspread over metallic surfaces, particularly on chromium, which is difficult to wet. It also ensures a residual oil film for longer periods on bearing faces which are subject to abnormal conditions of lubrication.

During a systematic examination of lubrication of steel with colloidal graphite using electron diffraction, it was found by Finch and Whitmore[6] that the particles of graphite could become incorporated into the Beilby layer. In effect, this would produce a graphited superface on a metal, with anti-seizure qualities. It can be simply demonstrated that a graphite film can withstand temperatures to 600° C in a normal oxidizing atmosphere and to about 1000° C in non-oxidizing atmospheres or where air is partially excluded.

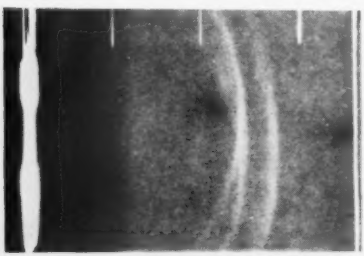


Fig. 6 (a)

Fig. 6 (b)

Some Practical Results

Perhaps the most widely known and popular attribute of colloidal graphite is its ability to offset seizure. For this reason it is employed as an additive to lubricating oils in new engines and mechanical equipment. Tests at the National Physical Laboratory in the past have pointed to the elevation of the critical temperature of an oil by colloidal graphite, the increase in maximum permissible loads and the reduction of minimum permissible feeds accompanying its use. It has been amply demonstrated that pure, truly colloidal graphite is quite suitable for ball bearings.

In 1938 the Research Department of the Institute of Automobile Engineers carried out cold starting and stopping tests, which revealed that colloidal graphite reduces cylinder wear in a new engine, under such conditions, by as much as 50 per cent. The addition of colloidal graphite to the petrol offered similar benefits, less corrosion of the piston rings being also observed, as shown in Fig. 7 (*a*) and (*b*). The graphoid surface formed on the cylinder walls and piston rings cannot be washed off by condensed fuel. Bench tests at engine manufacturers would indicate that the lower friction in a new engine with colloidal graphite in the oil is accompanied by a higher initial power output.

It is well known that the direction of machine finish marks on opposite rubbing faces, with respect to each other, will influence the friction and wear character of those faces. Fig. 8 reveals how colloidal graphite offsets this effect on mild steel, indicating also the importance of lubrication in running-in.

Utilization

For bench and road running-in colloidal graphite is now generally accepted as an eminently suitable additive. During the recent war it was widely employed for that purpose for mobile and static equipment. In reduction gears running-in is also facilitated and pitch-line noises, where present, are reduced by the cushioning effect of the graphite particles between the mating surfaces of the teeth. Aero engines make use of graphited oil for special assembly lubrication or for running-in components, where bedding-in presents problems for the oil film.

A useful feature of colloidal graphite in oil, or other carrier, is the way that it enables lubrication to be undertaken where continuous oil feeds cannot be arranged. An example is the selector-equipment on automatic telephone exchanges where a high concentration of colloidal graphite in oil ("Oildag") has been used for many years. Aircraft undercarriages provide another instance, while there are many automatic machines where continuous lubrication is not necessary, but where intermittent and regular attention is called for.

In metal-forming operations, such as extrusion, die forging, pressing and drawing, it is the growing practice to lubricate the dies with an oil or aqueous dispersion of colloidal graphite. The value of the flat microscopic particles between die and metal is exemplified in the drawing of tungsten and molybdenum filament wire, where "Aquadag" has been used on an international scale for the past thirty years. A closer examination of the conditions encountered in this work reveal that, while desirable, hydrodynamic effects or fluidity in a lubricant merely assist the extrusion of the oil film from between die and metal. That is why the non-fluid graphoid surface provides effective lubrication in such work.

Being able to resist temperatures at which oil and grease would be thinned

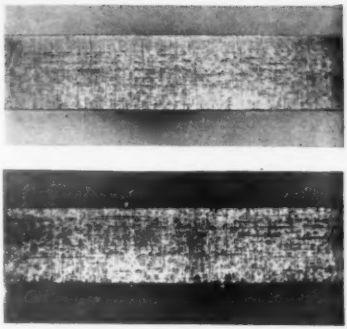


Fig. 7

(Top) *Ring after running with graphite petrol.*
(Bottom) *Ring after running with plain petrol.*

out or even carbonized, it is natural to expect that a graphited film would prove useful in the lubrication of the conveyors of annealing and normalizing furnaces, kiln car bearings, and automatic glass bottle machines. Generally, colloidal graphite in white spirit or low-carbon forming oil is recommended, but a newer technique is to form dry slippery films by means of the product in more volatile liquids.

It will be evident from the above somewhat sketchy review of the subject that colloidal graphite has a prominent place among oil additives. Indeed, it

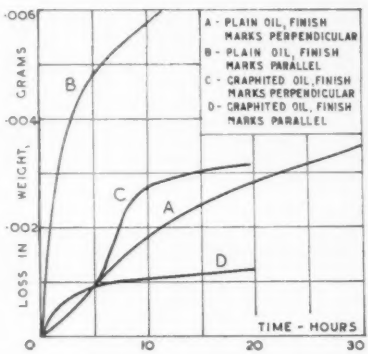


Fig. 8. Loss in weight for different finish marks.

was the forerunner of the many substances put into oil to-day, but continues to enjoy the unique distinction of being the only one with really high-temperature capabilities. The author has a bibliography of more than 400 references on colloidal graphite, but only a salient few are referred to here, with acknowledgement to the data on his company's files which has been used freely in the preparation of these notes.

REFERENCES

(1) Mabery, C. F. *Industr. Engng Chem.*, 1913, **5**, 717-23.

(2) Lipson, H., and Stokes, A. R. *Proc. Roy. Soc.*, 1942, 181 Ser. A, 101-5.

(3) Savage, L. *J. app. Phys.*, January 1948.

(4) Fogg, A., and Hunwicks, S. A. *J. Inst. Petrol.*, 1940, **26**, 1.

(5) Hughes, T. P., and Whittingham, G. *Trans. Faraday Soc.*, 1942, **88**, 9-27.

(6) Finch, G. I., and Whitmore, E. J. *Engineering*, 1938, **146**, 91.

TECHNICAL MANPOWER

In an editorial "Second Thoughts on University Expansion", *Nature*, in its issue of September 4, 1948, gives incidentally the following estimates:

In autumn 1947, the number of science students in British universities was about 14,500, about twice the pre-war figure. No substantial increase in the output of graduates available for employment is expected before 1950; thereafter there should be a rapid increase to about 5000 a year, or double the pre-war output. The first substantial increase in graduates in technology will likewise not be effective industrially till 1950, owing to the demands of military service, but by 1951 the output should be 3400 each year as compared with 1500 pre-war.

There are sufficient chemical appointments vacant to absorb all new graduates in chemistry up to 1949, and the demand appears to be increasing steadily. The demand for chemical engineers for the next five years is estimated to be 240 a year as compared with a present annual output of less than 100. The reduction in new construction has, however, reduced the demand for engineers, and in engineering generally it seems that supply is in excess of demand. About 600 graduates with honours in physics are now coming forward annually, in place of a little more than 200 before the war; this number is likely to be maintained for the next few years.

EMPIRE MINING AND METALLURGICAL CONGRESS

Preliminary details are now available of the 4th Empire Mining and Metallurgical Congress to be held in Great Britain in July 1949. The opening ceremonies will be held in London during the week-end July 9–11, and from Wednesday July 13 to Saturday July 16 there will be technical sessions, lectures, etc., in Oxford. On July 18 members will proceed to their various excursion centres.

The programme of technical sessions includes a paper on "Modern Oil Well Drilling and Production Technique," by H. W. Lane, O.B.E., M.Inst.Pet. (Anglo-Iranian Oil Co. Ltd.) and there will be an evening lecture on "Geophysics as Applied to Prospecting for Oil and Other Minerals" by Prof A. O. Rankine, O.B.E., F.R.S., D.Sc., F.Inst.Pet. Excursions from Cardiff include a visit to an oil refinery.

Further information is obtainable from the General Secretaries, 4th Empire Mining and Metallurgical Congress, 436 Salisbury House, Finsbury Circus, London, E.C.2.

A VISIT TO THE MIDDLE EAST

An Address by C. T. BARBER *to the Oil Industries Club.*

WHEN Mr Coxon invited me to give a talk on my visit to the Middle East, my first reaction was to decline, so forcibly was I reminded of those words which Rudyard Kipling put into the mouth of an Indian civilian who did not suffer cold weather visitors gladly. "Padget, M.P. was a liar and a fluent liar therewith. He spoke of the heat of India as the Asian solar myth."

I visited the Middle East in the cold weather, and most delectable it was but I shall endeavour to avoid a repetition of Mr Padget's error by suggesting that the Middle East is all cloudless skies, warm sunny days, and cool nights.

The first glimpse of the far-flung operations which to-day supply Europe with 25 per cent of its oil and within a few years will supply 80 per cent, was from the plane crossing the Syrian desert. Soon after leaving Damascus a narrow, slatey-blue road was discernible winding its way across the sandy waste, and a hundred yards or so to the south of it a line of telegraph poles cast the only shadows in this barren, tree-less land. Beneath them a slight ridge marked the course of the buried pipeline which carries oil from the Kirkuk field in Iraq to the Mediterranean coast some 600 miles farther west, where it is refined or shipped as crude to western Europe.

An hour later the four-engined plane landed on an oiled strip of desert near one of the pump stations. There a small group of people, men, women, and children waited to welcome us. They were eager for news from home: had there been a good harvest after the wonderful summer; was coal production increasing sufficiently to avert a fuel crisis in the coming winter; was there going to be a general election soon? They were not in the least self-centred and there was nothing in their bearing to suggest that such visits and the daily call by the small service plane, were the only contacts with the outside world of this community of some twenty souls. All around was desert, and beyond that more desert, but here in this artificial oasis was a miniature town with cinema, butchery, bakery, laundry, and dispensary, and a small cluster of houses with lawns and gardens.

The next stop was Baghdad, the ancient city of the caliphs; but let us press on to Kirkuk.

KIRKUK

Here is an oilfield which is surely unique: 60 miles long and two miles wide it has to date yielded 350 million barrels of oil in 12 years from 15 producing wells concentrated on a 9-mile stretch at the southern end of the field. So great is the degree of underground connexion within the reservoir rock that notwithstanding this concentration of production at one end of the structure, pressure decline and the rise of edge water throughout the reservoir have been uniform. This high degree of connexion, the great height of the oil column, and the low pressures associated with its shallow depth, have endowed the Kirkuk field with natural advantages which are not repeated to the same degree in any known oilfield in the world. From the very beginning the production system was devised to make full use of these characteristics, some of which were already established beyond doubt, and others deduced from the incomplete data then available with an instinct which has since proved unerring in its recognition of principles and forecast of performance in the years which then lay ahead.

To do so involved the determination of reservoir data with a degree of refinement which, so far as I am aware, has not been achieved elsewhere. In a reservoir 60 miles long and over 1000 feet thick, a few inches represent a lot of oil and a technique has been developed whereby fluid levels in the underground reservoir are measured to an accuracy of one inch and reservoir pressures to an accuracy of half a pound. One could talk for an hour and still fail to do justice to the Kirkuk field and to the engineering methods which have been employed in its development, but we must pass on. However, we cannot leave Kirkuk without a brief reference to the gas seepage at Baba Gurgur which has burned continuously since the time of King Nebuchadnezzar and which historians believe is the eternal fires to which Shadrach, Meshach, and Abednego were consigned. In daylight the fires are unimpressive; a host of small, faintly orange, smokeless flames at the bottom of a small depression some 100 feet in diameter. Individual foci of flame can be stamped out and are occasionally extinguished by gusts of wind, and the principal memory of a daylight visit is the pungent smell of sulphur dioxide. But at night the scene is one of impressive and exotic beauty: dancing wisps of bright blue flame, like brandy burning on a huge Christmas pudding.

The Terbol test well, near Tripoli, is on one of the most scenic locations in the world.

The Tripoli Test Well

Apart from their operations in Iraq, the Iraq Petroleum Co. group have large concessions and prospecting licences in Syria, Lebanon, Palestine, and southern Arabia. The visit to their test well near Tripoli in the Lebanon was a high spot of the tour, not only because this is one of the most scenic well locations in the world, but because of the praise of the American drillers for the British-built 10,000-ft rig which is in operation there.

The test well is situated 1264 feet above sea level on the limestone ridge which rises behind the town of Tripoli. It is reached by a road three miles long constructed by the Lebanon Petroleum Co. from a point on the coast road immediately north of the pipeline terminal. Winding at first through terraced olive groves it soon reaches more rugged limestone country and rises steeply by a series of hairpin bends. The location commands a magnificent view of the Mediterranean coast and of the westernmost portion of the town of Tripoli, with the twenty-seven 90,000-barrel tanks of the pipeline terminal immediately below, and tankers riding at anchor on the incredibly blue waters of the Mediterranean. Behind the 127-ft derrick a limestone crag rises precipitously for another 600 feet.

Of the 1000 odd components in the 10,000-ft drilling outfit, 550 including the rig itself, the derrick, crown and travelling blocks, rotary table, pumps and swivel were supplied by one British firm; 350 components are of American manufacture, and the balance from other British suppliers. So successfully have these components been blended into a complete unit that a minimum of teething troubles was experienced, and the drillers, all from California, spoke highly of the performance of the rig and of the British-built diesel engines by which it is powered.

Kurnub

Another of the test wells is situated near Gaza in southern Palestine and from there I was taken by one of the company geologists to the site of a future test at Kurnub, 15 miles south-east of Beersheba. Here is the most perfect "text-book" example of an anticline I have ever seen. It forms a range of hills rising some 2500 feet above the level of the surrounding plain, with the rugged, craggy outline so characteristic of the Judea Limestone wherever it outcrops in the Middle East. On the north-west flank, dips are from 5° to 10°, and on the south-east, where there is a sharp "knee-bend", dips in the Cretaceous strata are as high as 60°, rapidly flattening out to horizontal without disconformity in the overlying Eocene strata.

At a point direct south of the Kurnub police post the steep south-east flank is breached by the Wadi Hathira forming a narrow, steep-sided V-shaped valley in which the complete succession from the Eocene to the Lower Cretaceous is exposed. Making his way along the dry boulder-strewn stream bed, the visitor at length emerges into a natural amphi-theatre of breath-taking proportions: a perfect ellipse, nine miles long and four miles wide, entirely surrounded by precipitous limestone cliffs, 2000 feet in height; a gigantic natural sports stadium which would accommodate with ease the combined populations of Great Britain and France. The lime-stone rim of this anticlinal valley is breached by the single narrow opening formed by the Wadi Hathira, a stream which is dry for nine months of the year, but which has removed 2700 feet of sediment (weighing some 200,000 million tons) from the crestal portions of the structure.

As an example of geomorphology and of stream erosion the Kurnub structure deserves to become a classic. With over 3000 feet of closure it is also, from the purely structural point of view, ideal for the accumulation of oil. But here the

Welding the new 16-inch line from Kirkuk to Haifa.

Tertiary, Cretaceous, and Jurassic strata, the principal reservoir rocks of the Middle East, are either eroded or exposed by denudation, and the oil prospects depend entirely on the little-known potentialities of the Palaezoics. Although carboniferous oil occurs in faulted monoclines, and where lenses of sandstone rest on the edges of the granitic rocks of the Arabian shield, in Egypt and Sinai, these occurrences afford little guidance to the prospects of carboniferous oil accumulations in typical anticlinal structures of the Kurnub type. With such a perfect structure it is, however, a reasonable speculative venture and the results of the Kurnub test will be awaited with great interest.

Palestine

Motoring the full length of Palestine from Gaza to Haifa it was difficult to realize that this was a country on the verge of civil war. Except in Jerusalem, where barbed wire and defence posts were much in evidence, the country was outwardly peaceful and calm. In the bottoms of the valleys, which dissect the limestones of the Judea hills, Arab cultivators were busy ploughing with primitive wooden ploughs drawn by donkeys or camels.

On Sunday afternoon in Haifa, Jewish youths and their girls sat in the sunshine on the terrace of the Lev Ha Carmel hotel and whole families flocked to the neighbouring woods for picnics. That night the news of the UNO vote

on partition was received, and in the early hours of the morning the terrace of the hotel which, in the afternoon sunshine was so peaceful and idyllic, was transformed into a scene of wild, hysterical rejoicing. Dancing, singing, and shouting went on till dawn, and only then did one realize the tensions which lay so close beneath the façade of calm. Here a tribute must be paid to the magnificent morale of the British police and troops and of the oil company personnel. The uniformed British services had been the object of unprovoked attack for months yet they went quietly, calmly, and efficiently about their impossible task with exemplary discipline. Only the week before, four oil company men had been shot dead outside a cinema. The men with whom I discussed the situation both in the refinery and in the Iraq Petroleum Co. installation were under no illusions as to what lay in store in the months and possibly years which lay ahead, but they faced it squarely, with a serene resolution which I have not encountered since the days of the London blitz.

Across Arabia

From Haifa to Beirut and thence 1100 miles across the Great Arabian desert to Dharan in southern Arabia, a journey which fifteen years ago took forty days but which was accomplished in seven hours by the TAPLINE Dakota aircraft.

With the possible exception of the Syrian pump stations on the I.P.C. pipelines, the area of ARAMCO's operations is the most barren and inhospitable of all the oil areas of the Middle East, and climatically the worst.

Apart from the oases of Hasa, Hofuf, and Qatif, the desert is all-pervading. Around Dhahran and between there and the coast the terrain is barren, slightly undulating sand, varied only by the splintery limestone crags which form the rim rock of the Dammam field. For three months around Christmas the climate is pleasantly hot, but for the rest of the year the atmosphere is either charged with the steaming vapours which rise from the Persian Gulf, or choked with dust from the sand-storms which blow in from the dune country to the north and west. At Abqaiq we are already in the Jafura country, a belt of moving sand dunes projecting northwards from the Rub al Khali or "empty quarter". Here there is nothing but a sea of sand: sand dunes up to 100 feet in height rising in wave after wave and, although migratory—swallowing up roads, derricks, and installations—still and lifeless to the eye. The searing monotony of endless repetition is relieved only at sunset when the changing light endows the dunes with a rare but transient beauty. Drab yellow sands turn to richer shades of brown, lengthening shadows steal down the steep south-east flanks, and the tips of the dunes are suffused with amber and gold. But in the morning, this fleeting beauty has vanished like a dream and the pitiless sun again beats down on a petrified ocean of khaki sand.

It is in these surroundings that 1700 Americans, one of the largest American communities outside the United States, live and work. But the company has done everything that lavish expenditure and engineering skill can contrive to make life tolerable. Dhahran is a modern American city with paved streets; timber, brick, and masonry air-conditioned bungalows; clubs, mess-halls, and cinemas; laundries, barbers' shops, and beauty parlours; swimming pools, baseball grounds, and flood-lit tennis courts. There is a branch of the U.S. Post Office with batteries of individual post boxes, each with its own combination lock for every household, a company-operated weekly air service to Beirut, and a fortnightly one to the United States. Schools are provided where employees' children receive education to American standards up to

the age of fourteen, and it is proposed to extend this up to high school standard so that family separation, so frequently an inevitable consequence of service abroad, may be avoided.

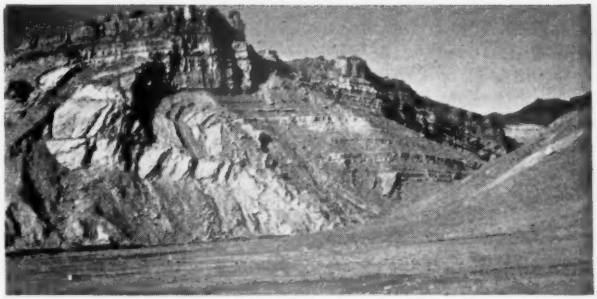


Photo by Petroleum Times

The south-west limb of the Agri Jari anticline, south-west Iran.

Imported cold stores, fruit and fruit juices, ice-creams, and breakfast cereals in every appetising variety and form, baked Virginia ham and grilled pineapple, corn-on-the-cob, and fried chicken Maryland sustain vitality and persuade the visitor to the air-conditioned mess-hall that he is back in Bartlesville or Bakersfield, in Tulsa, or in Taft.

Kuwait

The Sheikdom of Kuwait at the head of the Persian Gulf is 6000 square miles in area with a population of approximately 100,000, the majority of whom live in the ancient walled city of Al-Kuwait. This small sheikdom contains one of the largest oilfields in the world with reserves estimated by de Golyer at 9000 million barrels. Within a few years production from this field will probably reach 20 million tons per annum and the Sheik will then receive £5 million per annum in royalty, equivalent to £1 per week per head of the population, man, woman, and child. This is probably the most extreme case of the impact of the oil industry on the economy of a country and what the effect is going to be it is difficult to imagine. At present cigarettes are 1*s.* 3*d.* for 50, but unless wise and vigorous measures are taken, inflation will reach a pitch which is as yet unknown even in the Middle East. Wisely spent on the provision of schools, medical services, and water supply, these oil revenues can be of immense benefit to the community, but if they become available for the purchase of consumer goods they are capable of destroying the civilization of a settlement which is one of the most ancient trading posts in the Persian Gulf.

Iran

Now for a brief look at Iran. Having read about and seen photographs of Abadan, I thought I was prepared for the vast scale and ramifications of this largest refinery in the world, but I was not. It is breath-taking. The refinery itself covers an area of 377 acres and processes 16½ million gallons of oil a day. The water pump stations pump 20 million gallons an hour—one and a half times as much as the Metropolitan Water Board. Power utilized as steam and electricity is equivalent to over 100,000 horse-power, approaching the power consumption of the Central London area. But even more staggering is the scale of the housing estates and the amenities provided for the 35,000 Iranian employees. There are 5400 houses and another 5000 under construction or planned. There are clubs, schools and sports grounds, and hospitals

and dispensaries which in a single month last year treated over 100,000 patients.

I fear I have left very little time to deal with the five producing fields which together yielded 21 million tons of oil last year, but those who attended H. S. Gibson's Redwood lecture last March will realize the scope and great detail of the reservoir studies undertaken by the Anglo-Iranian Oil Co.

In the undivided control of the Masjid-i-Sulaiman field, which to date has produced 120 million tons of crude, making it the fourth largest producer in the world, "Anglo-Iranian" has had an opportunity, equalled only in some of the newer Middle East fields, of developing the field on scientific lines with the object of obtaining the maximum ultimate recovery of oil. Another favourable circumstance is the existence, 12 miles away in the Asmari Mountain, of an exposed full-scale model similar in shape and size to the Masjid-i-Sulaiman reservoir. Also, although a total of 229 wells has been drilled in the structure, not more than 31 have been used for production at any one time, so that a large number of wells has been available for observation purposes. The company has made the most of this conjunction of favourable circumstances with the result that more is known regarding the mechanism of the production of oil from the Masjid-i-Sulaiman field than of any other limestone reservoir in the world.

The production technique evolved from these studies has been applied in the newer fields of Iran, and Haft Kel, the second largest producing field in the world, is producing 9 million tons a year from 24 wells, as compared with East Texas which produces 17 million tons from 24,000 wells. It is a great story of British technical achievement and we were fortunate in hearing it from a man who has made a great personal contribution to it.

Now, a few words in conclusion: Middle East oil is not only Britain's most important overseas investment, it is also vital—and this includes the operations of the American companies —for the future of Europe and the world. At present it supplies Europe with 25 per cent of her oil. By 1951 it is scheduled to supply 80 per cent and in all probability within ten years the picture of world oil distribution will have entirely changed. The Caribbean will make good the American deficit; the U.S.S.R. will remain self-supporting, and the Middle East will supply the remainder of the world. It is a tremendous task, but technically the Middle East companies are capable of it. They will need all the help which the British and American Governments and equipment manufacturers can give them in the supply of materials and equipment, but "give them the tools and they will do the job".

WORLD'S LARGEST TANKERS

"THE world's two largest oil tankers—30,000 tons apiece—now under construction at Norfolk, Virginia, will be taken over by the Anglo-Saxon Petroleum Co. Ltd., on a five years' 'Time Charter'," said Reginald Dodds, general manager of the company's marine department, before leaving London recently on board a Pan-American Clipper for New York.

These tankers would be capable of carrying up to ten million gallons of crude oil per trip. Operating over the 1740 miles between Venezuela and New York, such ships could, allowing for crew rest and repairs, make twenty-two trips a year.

It was the aim of his company, said Mr Dodds, to operate these ships on the crude oil run from Kuwait and Venezuela to British refineries at Shellhaven, Heysham, and Stanlow. At the latter place a new dock to take these ships was to be constructed.

"MECHANISED FARMING"

In a foreword to *Mechanised Farming** James Turner, President of the National Farmers' Union of England and Wales, points out that the achievement of Britain's agriculture target of £100,000,000 worth of extra food annually depends in no small measure on farm mechanization and on the skill of those who handle the machines and implements.

In a report to the Loveday Joint Advisory Committee the Institution of British Agricultural Engineers stressed that the rate of increase in number and types of new machines outstrips the arrangements for training operators and maintenance staff. It emphasized the need for 64,000 trained men on the farm and in the workshops.

This 128-page book, with its 57 line drawings and many photographs, aims at helping all those who are concerned with agricultural machinery. It has three main themes: how engines, tractors, and farm machines work; how they should be operated; and how they should be maintained. The first chapter asks "Why mechanize a farm?" and is followed by an explanation of the internal combustion engine. Then there are five chapters on tractors, their mechanism, selection, and operation in various types of work. Fuels for farmers is the subject of chapter eight, which is followed by a discussion of the maintenance of farm implements. Lubrication and the prevention of rust have a chapter each, and are followed by one on the farm workshops and fuel storage. The next chapter on the mechanized dairy farm is concerned mainly with milking machines and coolers. Electricity on the farm is then discussed and the final chapter gives various facts and figures likely to be of use to a farmer.

The book was prepared under the general editorship of S. J. Wright, and various chapters were contributed by authors competent in the particular subject. It should be of considerable value to the farmer, to the tractor driver, and to the maintenance engineer.—*G. S.*

* Published by Anglo-American Oil Co. Ltd., 36, Queen Anne's Gate, London, S.W.1. 8*s.* 6*d.*

WORLD ENGINEERING CONFERENCE

On the invitation of the Egyptian Government the 2nd International Technical Congress of the World Engineering Conference will be held in Cairo during the period March 20–26, 1949.

The theme of the Congress will be "Raw Materials as an Industrial and Social Problem" and the three sections will deal with: (*a*) Industrial raw materials and their national utilization; (*b*) Social aspects of technical development and of raw material problems; and (*c*) the problem of water in the Middle East.

Details are obtainable from the Secretary of the British Committee of the W.E.C., 82 Victoria Street, London, S.W.1.

SOIL CLASSIFICATION AND COMPACTION

In selecting the methods now put forward in this new "British Standard Methods of Test for Soil Classification and Compaction" (B.S. 1377: 1948) special consideration was given both to field tests likely to be valuable in the control of construction work, and to tests mainly for use in soil mechanics laboratories. In several instances two or more methods have been given, one the more accurate "standard laboratory method" the others being "subsidiary field methods". Copies of the specification, price 7*s.* 6*d.* post free, are obtainable from the British Standards Institution, 28 Victoria Street, London, S.W.1.

PRIME MINISTER OF NORTHERN IRELAND VISITS LOBITOS REFINERY

Sir Basil Brooke, Prime Minister of Northern Ireland, was a distinguished visitor to the Lobitos Refinery at Ellesmere Port on September 21, 1948, the first of a number of visits he paid to industrial centres in the Midlands.

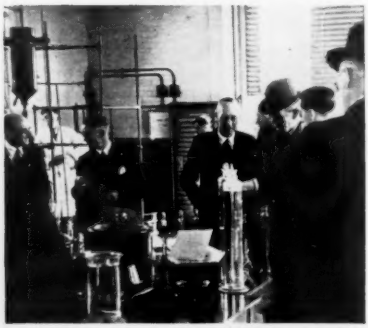
Sir Basil is welcomed at Fiddlestone Wood. (Left to right) A. T. Beazley, Lord Forres, Roland Dunn, Sir Basil Brooke, Sir Robert Grandsen, J. S. Parker, J. S. A. Don.

On arrival by steamer at Liverpool, Sir Basil was conveyed to the Lobitos senior staff hostel, "Fiddlestone Wood", near Burton, Wirral, where he was cordially welcomed by Lord Forres, acting chairman, Lobitos Oilfields Ltd., accompanied by A. T. Beazley, managing director and J. S. Parker, refinery manager.

After breakfast at the hostel the Prime Minister and his party, which included Sir Robert Grandsen, Cabinet Secretary, and Major-General Brooke Purdon, Northern Ireland Government agent in London, inspected the lovely grounds of the hostel before proceeding to the company's refinery at Ellesmere Port.

The tour of inspection covered distillation, solvent refining, solvent dewaxing, wax sweating and slabbing, and thermal cracking. All plants exhibited the raw material and products with which they were concerned and a comprehensive exhibit was shown in the research laboratory where the tour terminated.

Great interest was shown by the party in the refining side of the oil business.



An exhibit in the research laboratory is explained. (Left to right) M. Ingram, D. H. Tullis, J. S. Parker, Sir Basil Brooke, E. Bowes.

FORTHCOMING MEETINGS

INSTITUTE MEETINGS

Evaporation Losses at Marketing Installations. R. L. Sarjeant. At 26 Portland Place, London, W.1, 5.30 p.m. (tea 5 p.m.), December 8.

The Measurement of Kinetic Boundary Friction. F. T. Barwell and A. A. Milne. At 26 Portland Place, London, W.1, 5.30 p.m. (tea 5 p.m.), January 12.

Production from Condensate Reservoirs. L. C. Stevens and P. B. Boots. At 26 Portland Place, London, W.1, 5.30 p.m. (tea 5 p.m.), February 9.

LONDON BRANCH

Film Show—Atomic Physics. At 26 Portland Place, London, W.1, 6 p.m. (tea, 5.30 p.m.), December 21.

STANLOW BRANCH

By Sea and Air to South American Oil. J. S. Parker. At Town Hall, Chester, 7 p.m., December 15.

MEETINGS OF OTHER SOCIETIES

Model Scale Experiments on Waves and Beaches. R. A. Bagnold. The Institute of Physics. At New Physics Theatre, University of Manchester, 7 p.m., December 10.

Report on Heavy-oil Engine Working Costs, 1946–7. Diesel Engine Users' Association, at Caxton Hall, London, 2.30 p.m., December 16.

MIDDLE EAST OIL SUPPLY TO WESTERN EUROPE

THE Middle East contains the only presently available large reserves of oil which can be developed in time to meet the needs of Western Europe, Frank W. Abrams, Chairman of the Board of Standard Oil Company (New Jersey), said at a luncheon in his honour recently given in London by the American Chamber of Commerce. He pointed out that the unprecedented demand for oil products by a mechanized economy has brought about a change in the flow of petroleum from the Western Hemisphere eastward, and to-day, for the first time in history, the United States has become a net importer of oil.

As a result of this trend Europe and all of the Eastern Hemisphere now must look to the prolific fields of the Middle East for much of the petroleum that formerly came from South American countries and the United States. The speed and vigour with which the Middle East oil can be developed was cited as the most important factor in determining the rate at which the economies of Western European nations can expand.

"But", Mr Abrams added, "progress towards realization of this expansion programme has been retarded by political consideration, the adjustment of which lies far outside the orbit of the oil industry."

Mr Abrams emphasized that: 1. The development of Middle East oil and the facilities to handle it are essential to the well-being and progress of the nations in the Eastern Hemisphere; 2. The oil industry of the peace-loving countries is making an all-out effort to expand Middle East production; 3. Middle Eastern oil resources are not counted upon in the immediate years ahead to supply any significant part of the American market. They will have a great effect on the American oil picture, however, since their availability will reduce the necessity for the present large exports of oil from the Western Hemisphere; 4. The interests of the companies engaged in producing Middle Eastern oil are not political, but are based on peacetime commercial needs.

Mr Abrams said that the best working estimates that oil economists can make from data now available indicate that the world's daily consumption of oil is expected to rise from 9·5 million barrels in 1947 to 12 million barrels by 1952. Between now and 1952, he said, the industry must find sufficient quantities of new oil so that 2·5 million barrels a day can be added to production.

"We know", Mr Abrams said, "there is enough crude oil in the earth, found and yet to be found, to satisfy the demand for liquid fuels for many decades, perhaps even for centuries. We also know that when the natural supply of crude oil begins to fall short, we can make liquid fuel from natural gas, coal, and oil shales.

"The problem before the world suppliers of liquid fuel is not one of limited natural resources. Rather, it is one of developing those resources on a sufficiently broad basis so that production can expand as rapidly as demand increases, and products can be distributed in adequate quantities wherever they are needed."

"The job", he said, "is one of gigantic proportions. New facilities alone will require estimated capital expenditure equivalent to 13,000 million dollars during the five years 1947–52." He referred to exploration and development activities in Latin America, Canada, Europe, North Africa, India, Indonesia, and the Middle East.

Oil in quantities far above supplies now available to Western Europe is one of the important requirements to be met

under the Marshall Plan, Mr Abrams pointed out. The sixteen Marshall Plan nations will consume about 900,000 barrels a day in 1948, an increase of nearly 50 per cent over 1938. This total will grow to about 1·25 million barrels a day by 1952, when it is estimated that about 65 per cent of Europe's total requirements will come from the Middle East.

This involves a severe distribution problem. The sea route from the Persian Gulf to Western Europe, 6000 miles to the Channel ports, is expensive but feasible as long as the demand can be kept within the available tanker capacity. However, tankers far in excess of available tonnage will be needed to handle the greatly increased supplies anticipated from the Middle East within the next few years, and to carry oil by tanker from the Persian Gulf to the Mediterranean calls for more steel, manpower, and equipment, and higher operating costs than to move the same volume by pipeline.

Several oil companies in the Middle East are considering giant pipelines to the Mediterranean, cutting 3200 miles from the transportation route.

B. T. W. van Hasselt (left), a managing director of the Royal Dutch-Shell Group of companies, receiving the King's Medal from the Minister of Fuel and Power. The award, introduced in 1945 for service in the cause of freedom, was made in recognition of Mr van Hasselt's work during the war when he was in charge of Shell's Venezuelan oil production which was vital to the Allied war effort.

When these pipeline projects are completed and in operation it will be possible to transport almost 2 million barrels a day of Middle East crude oil and products to Eastern Mediterranean terminals for tanker shipment to European ports.

Expansion of refining capacity for handling increased production also is another large item in the oil industry programme.

The plans of the Anglo-American Oil Company, the Standard affiliate in the U.K., call for the construction at Fawley of a plant to handle approximately 128,000 barrels of crude oil per day. This will result in most important savings in dollar exchange as refining costs will be incurred in pounds instead of being included in the dollar cost of imported finished products.

Concluding, Mr Abrams expressed confidence that, despite current problems, the expansion programme of the oil industry will continue to go forward, "because oil men everywhere realize that increased productivity in the world can be one of the surest steps toward enduring peace".

ITALIAN REFINING

During August the refinery at Trieste of the "Aquila" company broke all records, pre- and post-war, with a crude oil input of over 54,000 tons for the 31 days. Although this refinery was almost completely destroyed by Allied bombing during the war, it was subsequently rebuilt in a little over eight months. Since operations were restarted in June, 1947, the distillation plant has processed an aggregate of 500,000 tons of crude.

Members of the Institute are invited to submit articles for publication in the *I.P. Review* and to forward details of their movements for inclusion in the "Personal" Column.

STEEL BY THE MILE

STANLOW Branch opened its 1948-49 session on September 15, 1948, with a visit to the Hawarden Bridge steel works of Messrs John Summers & Sons Ltd., at Shotton, near Chester. Thirty members took part in the visit and an equal number were unfortunately disappointed in the draw for places, as the size of the party had to be limited. It is, however, hoped that it may be possible to arrange a second visit later in the year.

These steel works are a well-known landmark at the beginning of the Dee estuary, being spread over an area of about 250 acres (a further 750 acres being available for extension). A new feature of the landscape is an enormous bank containing nearly two million tons of sand, dredged from the River Dee in connexion with reclamation work for future extensions to the plant. This latter, which employs a total labour force of approximately 6000 men, is principally engaged in the manufacture of steel sheeting, which literally comes from the strip mills by the mile. Production is steadily rising, being already in excess of the "target" figure for the works, and is approaching half a million tons per year. Raw materials, consisting of scrap iron and pig iron, in the respective proportions of approximately 70 and 30 per cent, are melted in a battery of open-hearth furnaces fired either by producer gas or oil. An interesting feature is an experimental furnace in which, at certain parts of the cycle, oxygen is used in place of air. Oxygen is delivered by road as liquid in insulated containers from the Manchester works of the British Oxygen Company.

After seeing the furnaces in operation and admiring the almost uncanny dexterity with which they were charged by means of a mechanical overhead crane, fitted with an arm that appeared to have nearly the manœuvrability of a human hand, the party proceeded to the slabbing mill, which handles a 6½-ton ingot of glowing steel and reduces it in size until it forms a suitable slab to act as a feed material for the next stage in the manufacture of steel sheets.

This slabbing mill is operated by a 12,000-h.p. steam engine, whose response to the controls was more what might have been expected from a small car engine rather than from the truly impressively massive proportions of this power plant.

The slabs leaving the slabbing mill are inspected for physical defects and, where necessary, these are removed with an oxy-acetylene flame. The slabs are then reheated ready for feeding into the continuous hot-strip mill. This latter, which is one of the only two in Britain, is undoubtedly the show-piece of the entire installation, forming a continuous plant over a quarter of a mile in length, operated by a battery of electric motors totalling 24,000 h.p., in which slabs of red-hot metal, varying in length from 6 to 15 feet, and from 3½ to

T. B. Aug Kessler, F.Inst.Pet. (left), general managing director of the Royal Dutch Company and for many years a managing director of the Shell Group of companies, being congratulated by the Rt. Hon. Hugh Gaitskell, Minister of Fuel and Power, after having received the insignia of the Order of the C.B.E. The award was made to Mr. Kessler for his valuable services in the petroleum field on behalf of the Allied war effort.

4¼ inches in thickness, are passed through a series of reducing rollers until they finally emerge as steel strip which may be as thin as 0·064 inch. The sight of some hundreds of feet of red-hot steel strip leaving the mill at a speed approaching 20 m.p.h., and being rolled up into a coil with the apparent ease of a typewriter ribbon, was one which was most spectacular and will long be remembered by those who were fortunate enough to witness it. The fact that the visit was paid in the evening tended to accentuate the vivid colours of the hot metal.

After leaving the hot-strip mill the coils of strip are pickled in acid to remove any scale formed, and then further reduced in thickness in cold mills. The majority of the strip is dispatched in relatively small-sized rectangular pieces which are chopped from the coil by shears of suitable power and dimensions. After shearing, the sheets are stacked in annealing furnaces where, under producer-gas pressure to prevent oxidation, they are fully annealed—a process which may take a week or longer—after which, subject to minor manipulations such as cold rolling, levelling, and coating with a film of oil to prevent rust, the sheets are ready for dispatch to the customer. Most of the distribution is done by road transport.

At every stage of the process the material is subjected to inspection, and as a final step, each piece is examined and if up to standard is individually stamped by an inspector with the Summers "Summit" Brand.

The uses to which this sheet steel are put are many and varied, but the motor-car industry is, perhaps, one of the biggest consumers, and it is interesting to note that, of the steel sheeting going into the cars on the roads of Britain to-day, just over half comes from these works.

The visit terminated with supper in the firm's canteen, where the chairman of the Stanlow Branch (C. D. Brewer) expressed the thanks of the visitors to Messrs Summers for their courtesy in arranging the visit and their hospitality, and especially to the guides who had taken the party round the works and had, with great patience and clarity, answered the numerous queries put to them.

PETROL SOLIDIFICATION

Dr L. R. B. Shackleton, of the Fuel Research Station, is to present a paper on "The Solidification of Petrol and the Production of Low-density Materials by an Emulsion Process" and to demonstrate his apparatus at a meeting of the London Section of the Institute of Fuel. The meeting will be held at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1, at 2.30 p.m. on Tuesday, December 7, and members of the Institute of Petroleum are cordially invited to attend.

P.S. VEHICLE LUBRICATION

A. T. Wilford, chief chemist to the London Transport Executive, and a member of Council of the Institute of Petroleum, is to deliver an address on "Lubrication of Public Service Vehicles" to the Automobile Division of the Institution of Mechanical Engineers. The meeting will be held in the Institution's lecture theatre in Storey's Gate, St. James's Park, London, S.W.1 at 6 p.m. on Tuesday, December 14. A cordial invitation is extended to members of the Institute of Petroleum to attend and to contribute to the discussion.

PERSONAL NOTES

H. H. Ballard, M.Inst.Pet., has been co-opted a Member of the Committee of the Northern Branch in place of *H. A. Ruffell*, who has resigned from the Committee.

Prof H. B. Nisbet, F.Inst.Pet., has been unanimously appointed Honorary Recorder of the Scottish Branch in succession to *A. Fleming*, who took the post of Honorary Secretary on the death of *William Robert Guy*.

Sir Robert Robertson, F.R.S., President of the Royal Society, and *W. L. Tregoning*, industrial adviser to the Finance Corporation for Industry Ltd., have been appointed as members of the board of Petrochemicals Ltd. Sir Robert has also joined the board of Petrocarbon Ltd.

F. Heron Rogers, M.Inst.Pet., announces that *D. G. Randall* has now entered into practice with him as consulting engineers, following the death of Basil Heastie.

Arnold Hoyland has been awarded the O.B.E. for his services to H.M. Government as petroleum advisor during and after the war. He accompanied the first Allied troops to enter Rome, where he obtained information of value in the bombing of German oil installations. On another occasion he reached the Leghorn refinery while it was still under fire from German troops. He was appointed general manager of Deutsche Shell A.-G. on January 1 last.

Commander H. V. Lavington, F.Inst.Pet., has been elected as chairman of the Trinidad Oil Companies' London Committee in place of the late Col. H. C. B. Hickling.

Philip H. Moore, F.Inst.Pet., has gone to New York to take charge of the office of Moore, Charlton & Associates Inc. at 230 Park Avenue, New York City.

G. S. Pound, F.Inst.Pet., has been appointed a director of the British Diesel Oil & Petrol Co. Ltd. He has been the company's refinery manager for the past ten years.

W. E. Madden, A.M.Inst.Pet., has been appointed general manager of United British Oilfields of Trinidad Ltd. in succession to *W. M. V. Ash*, who has left Trinidad to take up a position with the Shell Company in Toronto, Canada.

C. J. Hilton, A.M.Inst.Pet., machine shop superintendent of Trinidad Petroleum Development Co. Ltd., is now home on leave.

Dr R. O. Young, A.M.Inst.Pet., has left Trinidad and is now with the North Venezuelan Petroleum Co. Ltd., Apartado 592, Caracas, Venezuela.

K. W. Edwards, A.F.Inst.Pet., junior exploitation engineer with United British Oilfields of Trinidad Ltd., is now in Ecuador.

J. Moodie Fisher, a chemical engineering draughtsman with United British Oilfields of Trinidad Ltd., has been transferred to Borneo.

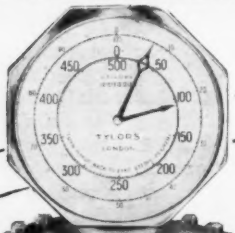
SOUTH WALES BRANCH

A meeting of the South Wales Branch of the Institute of Petroleum was held on October 22, 1948, at Britannic House, Llandarcy, when a paper on "Accuracy in Oil Measurement—Its Development and Significance" was given by H. Hyams, Esq. (a vice-president of the Institute and chairman of Standardization Sub-committee No. 1 on Sampling and Measurement).

The paper, illustrated by lantern slides, dealt with methods and problems of measurement, including dipping, ullaging, use of various gauges and meters, temperature measurement, volume and weight filling machines and measurement of ships' cargoes. It is hoped to reproduce the paper in a subsequent issue.

In the lively discussion which followed, Mr. Hyams elaborated on points arising from his paper.

VOLUMETERS FOR OIL, PETROL AND OTHER PETROLEUM PRODUCTS



ACCURACY

MAINTAINED

BALANCED PERFORMANCE RUGGED CONSTRUCTION

APPROVED BY THE BOARD OF TRADE (Standards Department)

TYLORS LIMITED

BELLE ISLE

ESTABLISHED 1777 **LONDON, N.7** 'PHONE: NORTH 1625

WORLD OIL MAP

The Petroleum Information Bureau has issued a revised version of its map of the world petroleum industry. On this map, which measures 38 in. by 19½ in. are shown the approximate locations of the world's oilfields and refineries and statistical information is given in appended tables regarding the crude oil production and refining capacity of various countries.

Copies of this map are obtainable from the Bureau at 29 New Bond Street, London, W.1.

SITUATION VACANT

SENIOR LABORATORY ASSISTANT for Factory near London. Knowledge and experience in formulation and protective paint materials required. Academic qualifications desirable. Salary level approximately £500 per annum. Apply to Bitumen Industries Ltd., Farnham Road Trading Estate, Slough, Bucks.

ELECTION TO COUNCIL

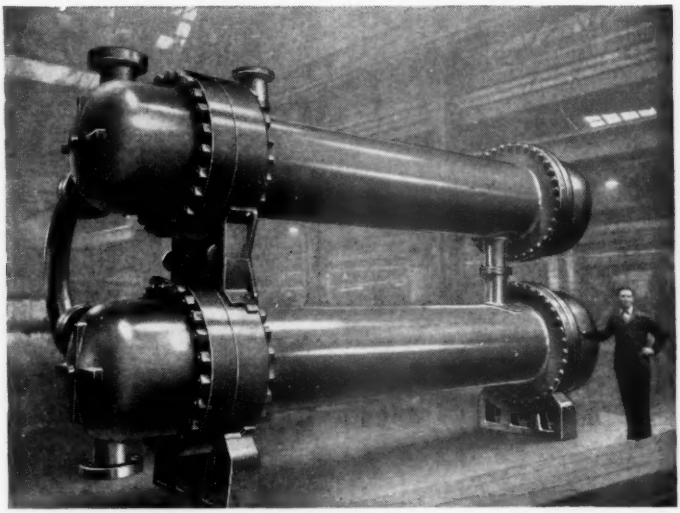
The attention of members of the Institute is directed to the following extracts from the by-laws governing election to the Council of the Institute:

72. Each and every Corporate Member may nominate in writing a Corporate Member for election as a Member of Council. . . . A nomination to be valid must be signed by at least six other Corporate Members and must be received by the Secretary not later than the thirty-first day of December in any year. No member may sign more than one such Nomination Paper at any one election. . . .

CHANGE OF ADDRESS

The Petroleum Information Bureau and the **Petroleum Films Bureau** are now in their new offices at 29 New Bond Street, London, W.1. Telephone numbers are unchanged as REGent 7565 and 6308.

HEAT EXCHANGE EQUIPMENT



HIGH PRESSURE HEAT EXCHANGERS

Surface per Unit	... ...	2170 sq. feet
Working Pressure in Tubes	...	1500 lb. per sq. inch

These two Units form part of a battery comprising 60 similar Units and having a Crude Oil throughput of 4½ million gallons per day.

A. F. CRAIG & CO., LTD.

CALEDONIA ENGINEERING WORKS

PAISLEY——————SCOTLAND

London Office: SALISBURY HOUSE, LONDON WALL, E.C.2

Telephone: MONarch 4756

American Associates:

THE KOCH ENGINEERING COMPANY, INC., WICHITA, KANSAS

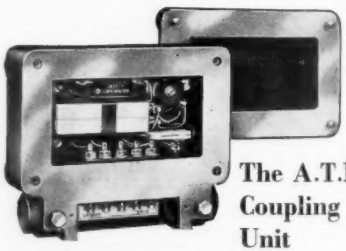
Direct Dialling

between telephones in safe and unsafe atmospheres

The A.T.M. auto-exchange coupling system enables fully automatic intercommunication to take place throughout an entire plant where petroleum atmospheres exist.

An intrinsically safe coupling unit and auto-repeater are fitted in the circuits which are extended into the hazardous areas. Dialling and speaking can then take place between persons in both the safe and unsafe areas through the automatic exchange which is installed in a safe area.

The system has been approved by the Factories Department (Certificate No. 44) for use in the presence of pentane vapour.



The A.T.M. Coupling Unit

This unit permits through speech and ringing, yet prevents the passage of dangerous voltages into the unsafe area. It consists of a series impedance network shunted by a disc of "Atmite"—a compound which has a high impedance at normal signalling and speech voltages, but has a low impedance at higher voltages. The change to low impedance takes place at voltages well below the dangerous level.

ATM auto-exchange coupling system

AUTOMATIC TELEPHONE & ELECTRIC CO. LTD. Export Dept. Norfolk House, Norfolk Street, London, W.C.2

TEMple Bar 9262. Inland Telegrams: Autelco, Estrand, London. Cables: Autelco, London. Strowger Works, Liverpool, 7, England

MANUFACTURERS

TO THE

BONA FIDE OIL TRADE only.

ECLIPSOL OIL CO. LTD.,
ROEBUCK LANE,
WEST BROMWICH.

PHONE:
WEST BROMWICH 0431-2-3-4.

GRAMS:
SOLUBLE, WEST BROMWICH.

Printed by Jarrold & Sons, Ltd., Norwich

Whatever method of transport employed, a Metal Container will carry it safely.

METAL CONTAINERS

METAL CONTAINERS LTD., 37 WATERLOO PLACE, PALL MALL, LONDON
WORKS ELLESMERE PORT & RENFREW ASSOCIATED COMPANIES OVERSEAS

M·W 65